Lipids

Triglycerides

Structure	Function
3 long non-polar, hydrophobic fatty acids with long hydrocarbon chains joined to a glycerol backbone via ester linkages through a process of condensation, with the loss of one water molecule. Numerous hydrogen and carbon and relatively fewer oxygen atoms due to the long hydrocarbon tails.	High proportion of C-H bonds from which energy in the form of ATP can be released during oxidation by dehydrogenation ⇒ Less oxidised than polysaccharides ⇒ Stores more energy per unit mass than polysaccharrides ⇒ More compact energy store. Oxidation also releases metabolic water in the process which is used as a source of water for animals especially desert animals
Long non-polar hydrophobic, hydrocarbon tails make up most of the triglyceride	Hence, triglycerides are insoluble in water as they cannot form hydrogen bonds with water. Thus, not affecting the water potential of the cell (osmotically inactive)

Main function:

- Compact energy store

Other functions:

1. Produce metabolic water during oxidation of triglycerides which is used as a source of water for desert animals
2. Subcutaneous fat acts as thermal insulation to mammals especially in marine mammals as they are poor conductors of heat
3. Lipids help to improve the buoyancy in mammals, especially marine mammals, as they are less dense than water
4. Lipids form a protective layer around delicate internal organs of mammals, acting as shock absorbers and protecting organs from mechanical damage
5. Lipids can function as a reservoir for the storage of fat soluble vitamins such as vitamins A, D and K

	Structure	Function

Phospholipids	2 non-polar, hydrophobic hydrocarbon tails and 1 negatively-charged hydrophilic phosphate group associated with a glycerol backbone ⇒ Amphipathic	Charged, hydrophilic phosphate heads face outwards and interact with aqueous environment of cell interior or exterior while hydrophobic tails face inwards, away from the water, interacting with each other via hydrophobic interactions ⇒ Allows phospholipids to arrange to form a **phospholipid bilayer** which forms the cell membrane ⇒ **Hydrophobic core** of phospholipid bilayer acts as a barrier to movement of hydrophilic charged ions and polar molecules ⇒ Selectively permeable cell membrane as hydrophobic core is only permeable to small hydrophobic solutes Passage of these molecules across the membrane can be controlled by transmembrane transport proteins or ion channels This allows compartmentalisation to take place where specialised processes can be isolated in each compartment
Cholesterol	Hydrophobic fused four ringed structure with a hydrophilic end makes it slightly amphipathic	Allows cholesterol to align with phospholipids in the membrane and regulate membrane fluidity: • Prevents excessive fluidity at high temperatures by restricting phospholipid movement through its interactions with phospholipids • Prevents freezing at low temperatures by preventing close packing of phospholipids

Fats emulsion test

- Procedure:
  1. Add 2 cm^3 of ethanol to 2 drops of the test sample in a test tube
  2. Mix well and allow to stand for 2 minutes
  3. Decant the ethanol into another test tube containing 2cm^3 of water

- Observation:
    - If absent, homogenous solution is formed with ethanol and solution remained homogenous when water was added
    - If present, homogenous solution is formed with ethanol and an emulsion was formed when water was added